

Resolving a critical question in predicting woody biomass supply to the Northern Forest industry: Estimating risk perception and willingness to harvest from small woodland owners

Principal Investigator: Jessica E. Leahy

Affiliation/Institution: University of Maine School of Forest Resources

Email: jessica.leahy@maine.edu

Mailing address: 241 Nutting Hall Orono, ME 04469

Co-Principal Investigators: Aaron Weiskittel

Affiliations/Institutions: University of Maine

Emails: aaron.weiskittel@maine.edu, emily.j.silver@maine.edu,
donald.j.mansius@maine.gov

Collaborators and Affiliations: , Emily Silver (University of Maine), Donald Mansius (Maine Forest Service)

Completion date: June 30, 2014

- Private woodland owners have mixed attitudes towards and low knowledge of biomass harvesting in Maine, but a desire for more information.
- The majority of landowners are unwilling to harvest biomass for bioenergy markets

Funding support for this project was provided by the Northeastern States Research Cooperative (NSRC), a partnership of Northern Forest states (New Hampshire, Vermont, Maine, and New York), in coordination with the USDA Forest Service.

<http://www.nsrcforest.org>

Project Summary

Predicting and understanding timber supply is one central component to the viability of the bioenergy industry. This study seeks to understand the knowledge, attitudes, risk perception, and willingness to harvest timber for bioenergy markets. Thirty-two interviews were conducted with private woodland owners (non-industrial, family owners) in Maine who had previously harvested timber, had never harvested timber, and had harvested timber for woody biomass markets to explore these concepts in depth. Results indicate that private woodland owners have little knowledge of biomass harvesting, but a desire to learn more. Attitudes toward biomass harvesting were mixed, with negative attitudes about nutrient removal, poor economics, and biomass as a poor end-use for wood products. Positive attitudes towards biomass pertained to fossil fuel replacement, a use for low-quality wood, and strengthening Maine's forest economy. Some owners expressed a willingness to supply timber for biomass, but not all landowners that had harvested for bioenergy markets would do so again. Many landowners felt that biomass was not economically feasible and felt the risk of damaging forest ecosystems did not outweigh potential benefits in having a market for low-value wood materials. It did not matter to landowners where the materials ended up, what they were used for (electricity vs. conversion into a mobile fuel source), or what was done with the byproducts of wood burning. Rather, once the wood leaves their property, they don't dwell on the specifics other than hoping it goes to the best possible end use. These results help provide insight to available timber supply for the bioenergy industry and provide an assessment of landowner awareness of timber harvesting options. The Northern Forest region is an ideal place for locally-sourced wood-based heat, due to an abundance of wood and a rural population that could benefit from reduced energy costs. However, the vast majority of forests are owned by private woodland owners, so timber supply for wood-based energy production could be severely constrained by the motivations and willingness to harvest by private woodland owners. Better outreach, information, and market conditions are important to facilitate biomass harvesting on private woodlands in the Northern Forest.



Background and Justification

- Private woodland owners own 42% of forests nationally, and over 49% in Maine (over 43% of Maine's forests are owned by private industrial owners)
- Predicting and understanding timber supply of private woodland owners is central to the viability of the bioenergy industry
- Decision-making environment of private woodland owners is not fully understood
 - Decision to harvest timber : a moving target (Amacher et al. 2003, Fischer et al. 2010)
 - Willingness to harvest for biomass is typically low (Butler et al. 2010, Becker et al. 2009)

Background and Justification

Table of the significant variables that predict the intention to harvest timber, with citations. Italicized variables are those that had both a positive and negative effect on timber harvesting.

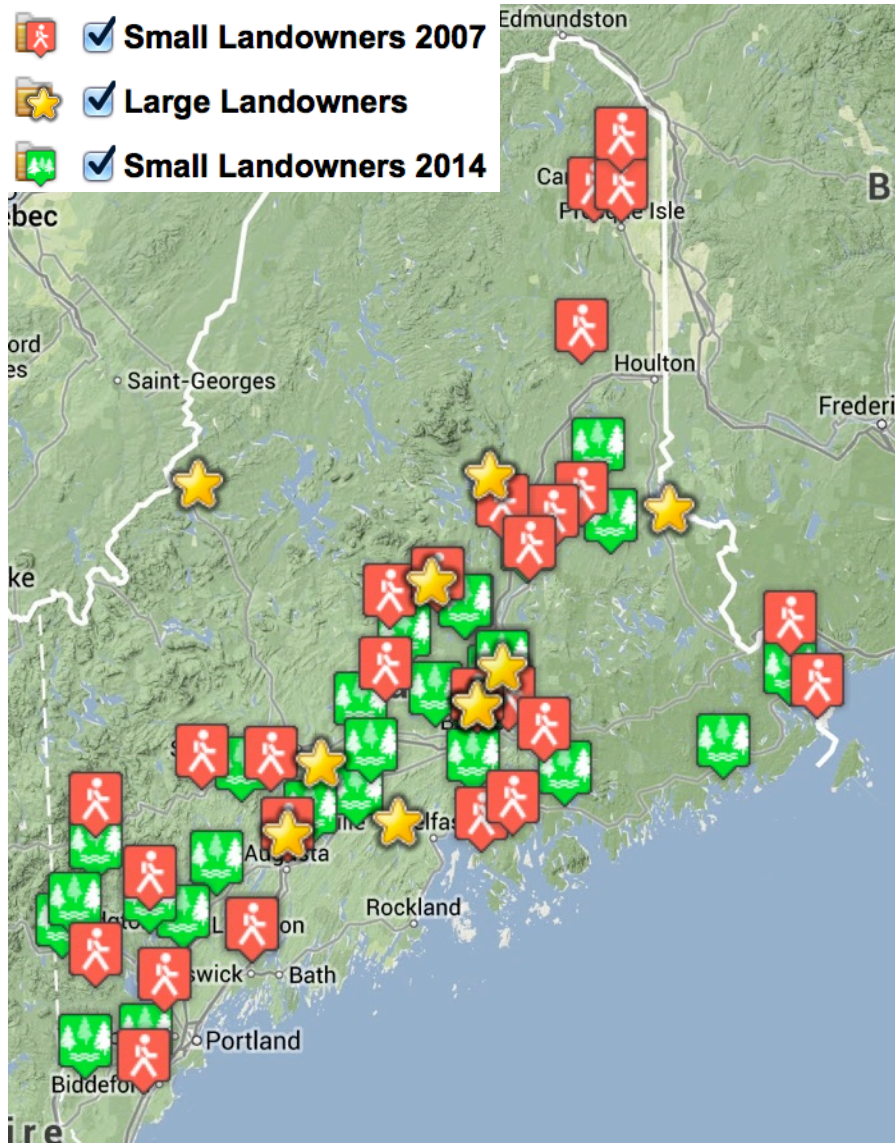
Influence	Variable	Citations
Positive	Parcel size/Forested acres	Cleaves & Beckett 1995; Conway et al. 2003; Greene & Blatner 1986; Hendee & Flint 2013; Hyberg & Holthausen 1989; Jamnick & Beckett 1987; Larsen & Gansner 1973; Lidestav & Ekstrom 2000; Pan et al. 2007; Potter-Witter 2005; Stordal et al. 2008; Straka et al. 1984; Binkley 1981; Boyd 1984; Holmes 1986
	Harvest price per acre	Conway et al. 2003; Favada et al. 2009; Kuuluvainen & Salo 1991; Adams & Haynes 1980; Binkley 1981; Boyd 1984; Holmes 1986
	Years of formal education	Greene & Blatner 1986; Binkley 1981; Boyd 1984; Joshi & Arano 2009; Stordal et al. 2008
	Years the land has been in the family/Inheritor/ Years owned	Jamnick & Beckett 1987; Joshi & Arano 2009; Majumdar et al. 2009; Vokoun et al. 2006
	<i>Income</i>	Cleaves & Beckett 1995; Larsen & Gansner 1973; Stordal et al. 2008
	White collar occupation	Dennis 1990; Binkley 1981; Boyd 1984
	Management plan	Dhubain et al. 2010; Joshi & Arano 2009; Stordal et al. 2008
	<i>Farmer</i>	Favada et al. 2009; Greene & Blatner 1986; Jamnick & Beckett 1987
	Contact with a forester/Technical Assistance	Greene & Blatner 1986; Hyberg & Holthausen 1989; Holmes 1986
	Debt-to-income ratio	Conway et al. 2003; Stordal et al. 2008
	Timber production ownership objective	Dhubain et al. 2010; Joshi & Arano 2009
	Extension activity attendance/Cooperation with Forest Service	Dhubain et al. 2010; Ficko & Boncina 2013
	Timber stock	Favada et al. 2009; Prestemon & Wear 2000
	Site value tax/Site quality	Favada et al. 2009; Lidestav & Ekstrom 2000
	Proportion of household income from forest	Gan et al. 2003; Jamnick & Beckett 1987
Membership or contact with a wood owner's association	Jamnick & Beckett 1987; Potter-Witter 2005	
Negative	Absentee owner/ Distance from residence	Conway et al. 2003; Ficko & Boncina 2013; Hendee & Flint 2013; Jamnick & Beckett 1987; Potter-Witter 2005; Stordal et al. 2008
	<i>Income/Wage</i>	Hyberg & Holthausen 1989; Jamnick & Beckett 1987; Kuuluvainen & Salo 1991; Larsen & Gansner 1973; Stordal et al. 2008
	Age	Favada et al. 2009; Joshi & Arano 2009; Lidestav & Ekstrom 2000; Stordal et al. 2008
	<i>Farmer/Occupation</i>	Gan et al. 2003; Joshi & Arano 2009; Kuuluvainen & Salo 1991
	Non-timber ownership objectives/Amenity objectives	Greene & Blatner 1986; Hendee & Flint 2013



Methods

- 32 interviews (small private woodland owners)
- Network sampling in 3 categories: landowners that have harvested for biomass, harvested timber for any market, never harvested timber, but plan to
- Analysis in NVivo (qualitative coding software)
- Semi-structured interview questions
 - History of land ownership
 - Concerns about the land, perceived risks to the forest
 - Relevance of timber harvesting
 - Community attributes
 - Opinions about biomass scenarios
 - Cognitive mapping of decision making process

Methods



Approximate locations of interview participants' woodland. The results of this study can be compared to a dataset of private woodland owners (large and small) from 2007 represented by red squares and yellow stars

Methods

- Biomass scenarios read during the interview process
 - *Your land is harvested. The harvest residue (tops, limbs, small materials, unmerchantable timber) is taken by truck to an existing pulp and paper mill. There, it is converted to gasoline to power commercial automobiles. The char leftover from this conversion process is then landfilled.*
 - *Your land is harvested. The harvest residue is taken by rail to a power-plant. There, it is used for electricity and the char leftover is sold as a soil amendment for nutrients.*
 - *Your land is harvested. The harvest residue is taken by truck to a power-plant. There it is converted to diesel for off-road vehicles (i.e. harvesting equipment) and excess energy is used for electricity. The leftover char is burned for fuel in the chemical processes.*



Results: Perceived risks to forest and timber harvesting

Risk to forest	Count	Supporting quotation
Invasive species/Pests and Diseases	22	<i>"The spruce budworm's comin'." Male, < 40 yrs</i>
Fire	7	<i>"I'm really concerned about forest fire." Male, 40-60 years old</i>
Development pressure	6	<i>"I'm afraid of a sub-division going in there." Male, < 40 yrs</i>
Trespassing/ Recreation	6	<i>"Now they want to come running through on their 4-wheelers." Female, > 60 yrs</i>
Wind/Ice damage	5	<i>"Well the worst damage to the trees from ice storms and wind", Male 40-60 yrs</i>
Bad logging practices	5	<i>"He cut more trees than he said he was going to" Male, > 60 yrs</i>
Tree mortality = loss of money	5	<i>"Because you can let stuff go to long and you can harvest stuff too soon. And you never really know." Male < 40 yrs</i>
Climate Change	3	<i>"Climate change is bothering me, too." Female, > 60 yrs old</i>
Taxes	3	<i>"The interest rate on undeveloped property is much higher than on regular" Female, 40-60 yrs</i>
Beavers	1	<i>"Fire, beavers, what else can happen to it..." Male, 40-60 yrs</i>
Loss of timber markets	1	<i>"We had a lot more opportunities for sawmills or whatever. All gone. Who's gonna wanna take this stuff, you know?" Male, 40 – 60 yrs</i>

Results: Biomass harvesting

	Would harvest biomass	Would not harvest biomass
Concerns	<ul style="list-style-type: none">• Nutrient removal• Low cost• Harvest is destructive	<ul style="list-style-type: none">• Would displace other wood markets• Not the 'highest-value' product• Nutrient removal
Definitions	<ul style="list-style-type: none">• Firewood• Take out small material for chips• Low dollar	<ul style="list-style-type: none">• Byproduct of harvesting• Harvesting small diameter materials• Wood for fuel/heat
Perceived benefits	<ul style="list-style-type: none">• Replace fossil fuels• Habitat creation for wildlife• 'Clean' the site	<ul style="list-style-type: none">• Maine wood products used

Results: Biomass concerns

- Top concerns are price and nutrient removal
- Pervasive need for “better research” and “more information” before deciding to allow a biomass harvest
- General consensus that biomass is not the highest value market for woody material
- Landowners do not typically care where products go once they leave the woodland (or what they are used for), but rather care about the implications of a biomass harvest on their woodland.

“Part of the idea of a natural forest is that you are going to have trees fall and decay and that sort of thing, and build the nutrient base of the forest. If, in fact, I'm taking the biomass and pulling it out, am I going to damage that? Right?”

Male, > 60 year old



Results: Willingness to harvest

- Thirteen landowners expressed a willingness to harvest biomass for bioenergy production.
- Two landowners were strongly against having a biomass harvest on their woodland.
- The other seventeen either did not have enough knowledge to decide or expressed a neutral opinion about their willingness to harvest biomass.
- Of the thirteen who were willing to harvest, many expressed willingness conditional on some factor.
- *“Well I guess if it was in the context of another activity that was going on, I would be, but I wouldn’t want a skidder out there looking for dead logs.” Male, < 40 years old*
- *“If my woodlot generated enough pulp and the decision of the forester was that it would be better moved by chipping and blowing it into a truck, that’s fine with me. But what I don’t want is for every twig to come out and be blown into that tractor trailer and leave.” Male, > 60 years old*
- *“I really would like to do biomass chipping and have a nice clean forest.”*
- *“I mean biomass harvesting gives you the potential to do some things silviculturally that you can’t afford to do otherwise” Male, > 60 years old*

Implications and applications in the Northern Forest region

- The Northern Forest region is an ideal place for locally-sourced wood-based heat, due to an abundance of wood and a rural population that could benefit from reduced energy costs. However, the vast majority of forests are owned by private woodland owners, so timber supply for wood-based energy production could be severely constrained by the motivations and willingness to harvest by private woodland owners.
- Better outreach, information, and market conditions are important to facilitate biomass harvesting on private woodlands in the Northern Forest.

Implications and applications in the Northern Forest region

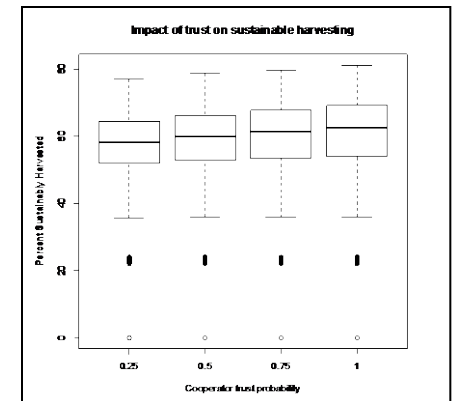
- Potential webinar topics for private woodland owners:
 - What is biomass harvesting?
 - State of the Art: Existing bioenergy facilities and opportunities in Maine
 - Ecological impacts of biomass harvesting: What do we know?
- Landowners would appreciate fact sheets and research summaries of the impacts of biomass on their land and the market opportunities available to them.

Future directions

- Compare 2014 results with a 2007 dataset of interviews and surveys that ask questions about willingness to harvest biomass
- Look at conservation behavior adoption of transitioning from oil to wood-burning stoves in personal homes (grant submitted)
- Agent-based model of landowner communication and timber harvesting decisions



Preliminary analysis of the impact of trust on harvesting decisions in an agent-based model. The more a landowner trusts a forester, the more likely they are to harvest sustainably.



List of Products

Peer-reviewed Publications

- Silver, E.J., Leahy, J.E., Weiskittel, A., Noblet, C.L., Kittredge, D.B. 2014. Maine woodland owner perceptions of biomass harvesting and bioenergy. In preparation, Expected finish date July 1st, 2014.
- Silver, E.J., Leahy, J.E., Weiskittel, A., Noblet, C.L., Kittredge, D.B. 2014. An evidence-based review of timber harvesting among private woodland owners. Expected finish date July 1st 2014.
- Silver, E.J., Leahy, J.E., Kittredge, D.B., Noblet, C.L. 2014. Psychological distance of timber harvesting for private woodland owners. Expected finish date August 1, 2014.
- Silver, E.J., Leahy, J.E., Weiskittel, A., Noblet, C.L. 2014. Risk perception of harvesting timber for biomass production. In preparation, Expected finish date September 1st, 2014.
- Silver, E.J., Leahy, J.E., Weiskittel, A., Hiebeler, D. 2014. An agent-based predictive model of private woodland owner communication and sustainable harvesting decisions. Expected finish date December 1, 2014.

Other Publications

- Silver, E.J., Leahy, J.E. 2014. Social availability of biomass in Maine: Perspectives of private woodland owners. A report written for the Sustainable Energies Pathways grant team and the Maine Forest Service

Conference Presentations

- “Risk perception and relevance of timber harvesting for private woodland owners: A qualitative examination.”, International Symposium on Society and Resource Management, Hannover, Germany, 2014.
- “Risk perception and relevance of timber harvesting for bioenergy production: A qualitative examination of private woodland owners”, *Maine Water and Sustainability Conference*, 2014
- “Risk perception of timber harvesting for bioenergy production: A qualitative examination of private woodland owners”, *New England Society of American Foresters Annual Meeting*, 2014
- “Private Woodland Owner Timber Harvesting Behavior: The difference between attitudes, intentions, and behavior”, *Society of American Foresters National Convention*, 2013

Websites/Databases

- Interview data posted to the University of Maine Dataverse server.

Graduate Student Grants

- Sustainability Solutions Initiative Travel Grant, \$827, to Emily Silver
- Graduate Student Government Travel Grant, \$416, to Emily Silver

Pending Grants

- Understanding Individual & Community Level Conservation Behavior Adoption of Sustainable Forest-Based Heating Alternatives in Rural New England, USDA NIFA AFRI, \$499,000, *in review*